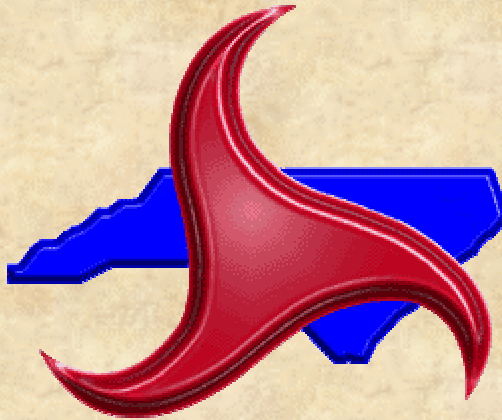# Trip Generation Training

Prepared by NCDOT

Traffic Engineering & Safety System Branch

Access Management Group

What is Trip Generation?

✓ Institute for Transportation Engineers (ITE)

– Research to find a correlation between variables and trips generated by different land uses.

✓ Background of Trip Generation

– Based off thousands of studies and utilizing statistical analysis for forecasting.

✓ Purpose of Calculations

Objectives

✓ To provide an understanding of the aspects of Trip Generation.

✓ Review the changes and new additions for the 7th Edition of the ITE Trip Generation Manuals.

✓ Overview of the 2004 Trip Generation Training sessions.

Purpose in Pictures
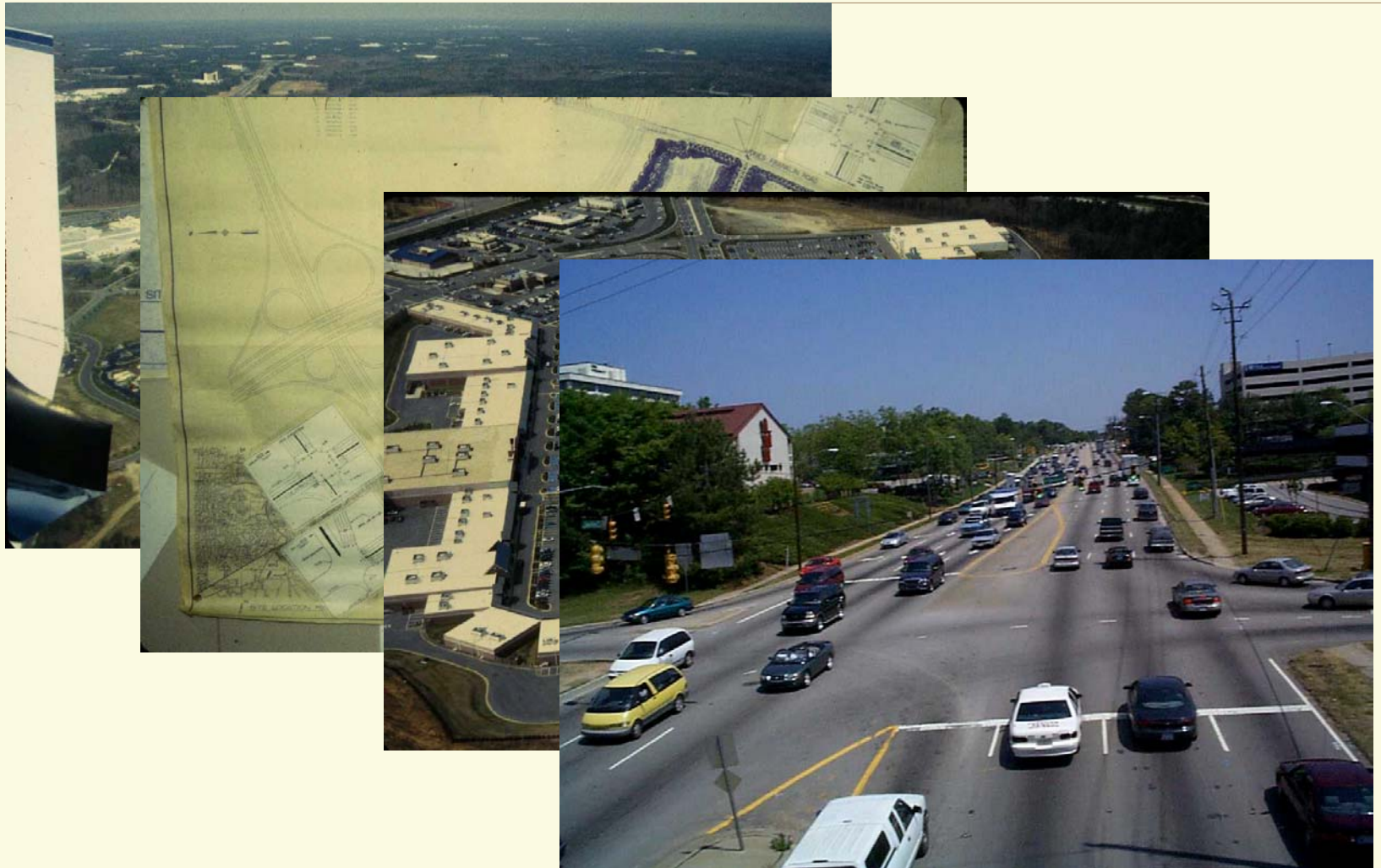
Selecting Independent Variables

✔ Choose a variable that:

    A. Most directly causes variation in trip ends.

    B. More appropriately reflects the proposed development.

✔ Example:
  – Convenience Market w/ Gas Pumps
    • Square footage vs Vehicle fueling positions

Selecting Time Period

✔ The time period analyzed should be the time period in which the combination of the trip generated traffic and adjacent street traffic is the maximum (Normally weekdays).

✔ Areas of high tourism, college areas, and seasonal effects should be monitored with caution.
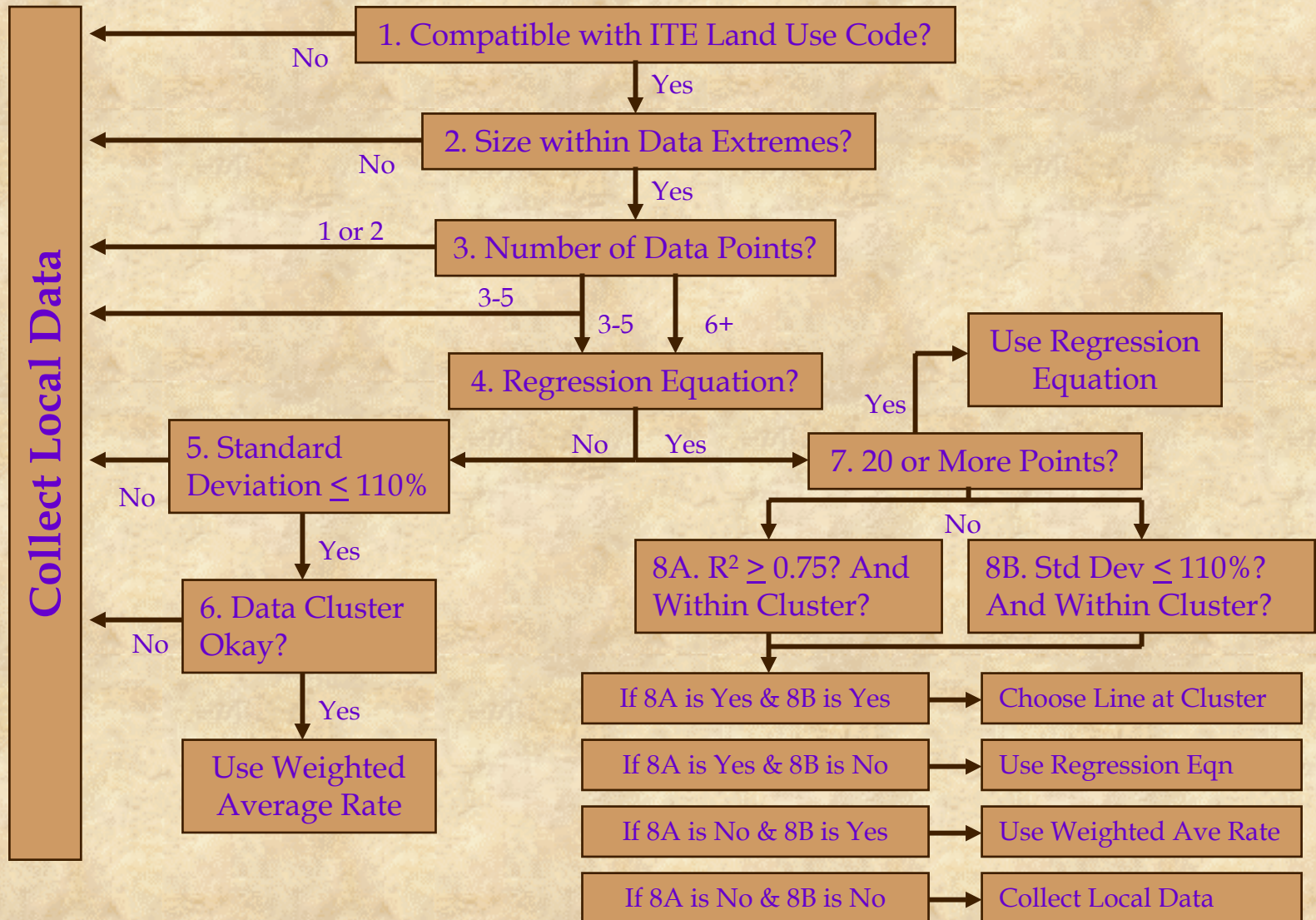
Complex Sites

Methods for Trip Generation Estimations

1. Regression Equation

2. Weighted Average Trip Generation Rate

3. Data Plot (Local Data Collection)

✔ The objective is to choose the method which gives the most accurate estimation.

Selecting Between Rates and Equations

Collect Local Data

1. Compatible with ITE Land Use Code? — No →

Yes ↓

2. Size within Data Extremes? — No →

Yes ↓

3. Number of Data Points? — 1 or 2 →

3-5 →

3-5 ↓   6+ ↓

4. Regression Equation?

7. 20 or More Points? — Yes → Use Regression Equation

No → 4. Regression Equation?

5. Standard Deviation $\leq$ 110% — No →

Yes ↓

6. Data Cluster Okay? — No →

Yes ↓

Use Weighted Average Rate

7. 20 or More Points? — No

8A. $R^2 \geq 0.75$? And Within Cluster?

8B. Std Dev $\leq$ 110%? And Within Cluster?

If 8A is Yes & 8B is Yes	→ Choose Line at Cluster
If 8A is Yes & 8B is No	→ Use Regression Eqn
If 8A is No & 8B is Yes	→ Use Weighted Ave Rate
If 8A is No & 8B is No	→ Collect Local Data

General Office Building
(710)

Average Vehicle Trip Ends vs:	1000 Sq. Feet Gross Floor Area	
On a:	Weekday,	
	P.M. Peak Hour	

Number of Studies: 235
Average 1000 Sq. Feet GFA: 216
Directional Distribution: 17% entering, 83% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
1.49	0.49 - 6.39	1.37

Data Plot and Equation

Fitted Curve Equation: T = 1.12(X) + 78.81 $R^2 = 0.82$
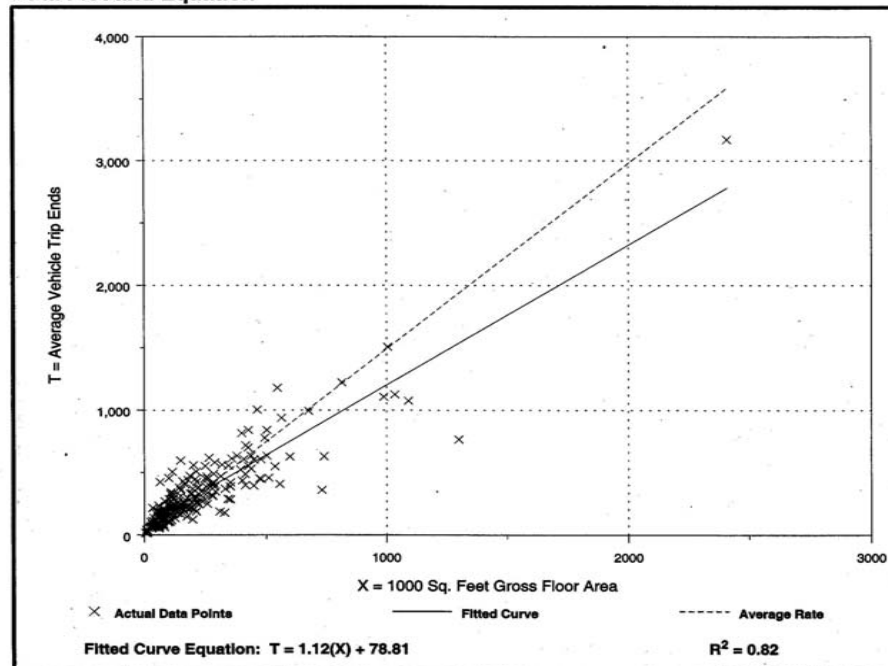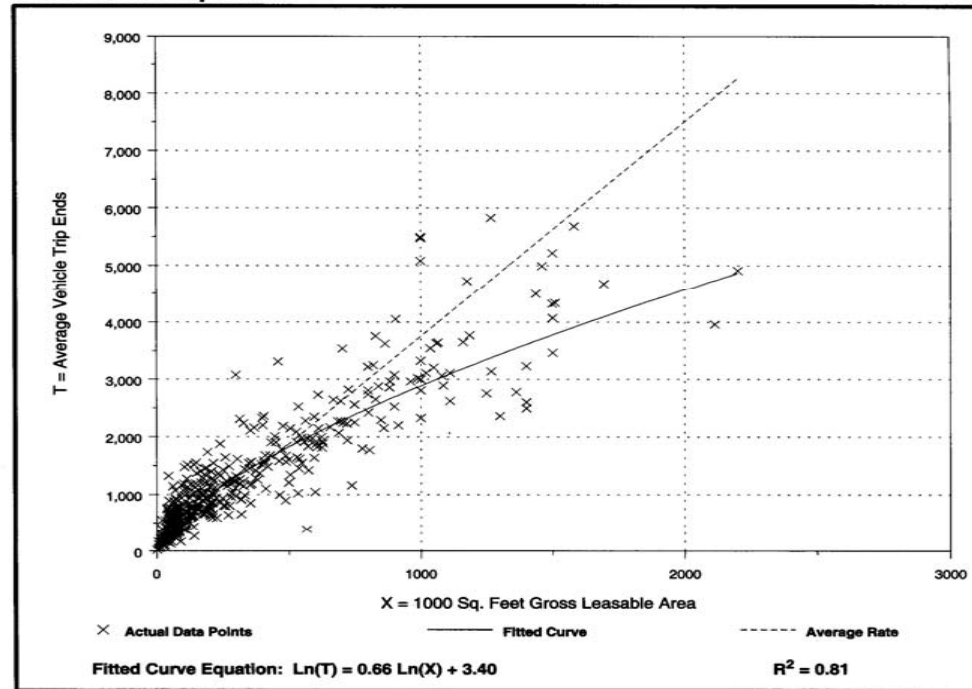
Shopping Center
(820)

Average Vehicle Trip Ends vs:	1000 Sq. Feet Gross Leasable Area
On a:	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.

Number of Studies:	407
Average 1000 Sq. Feet GLA:	379
Directional Distribution:	48% entering, 52% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
3.75	0.68 - 29.27	2.75

Data Plot and Equation

X Actual Data Points   Fitted Curve   - - - - - - Average Rate

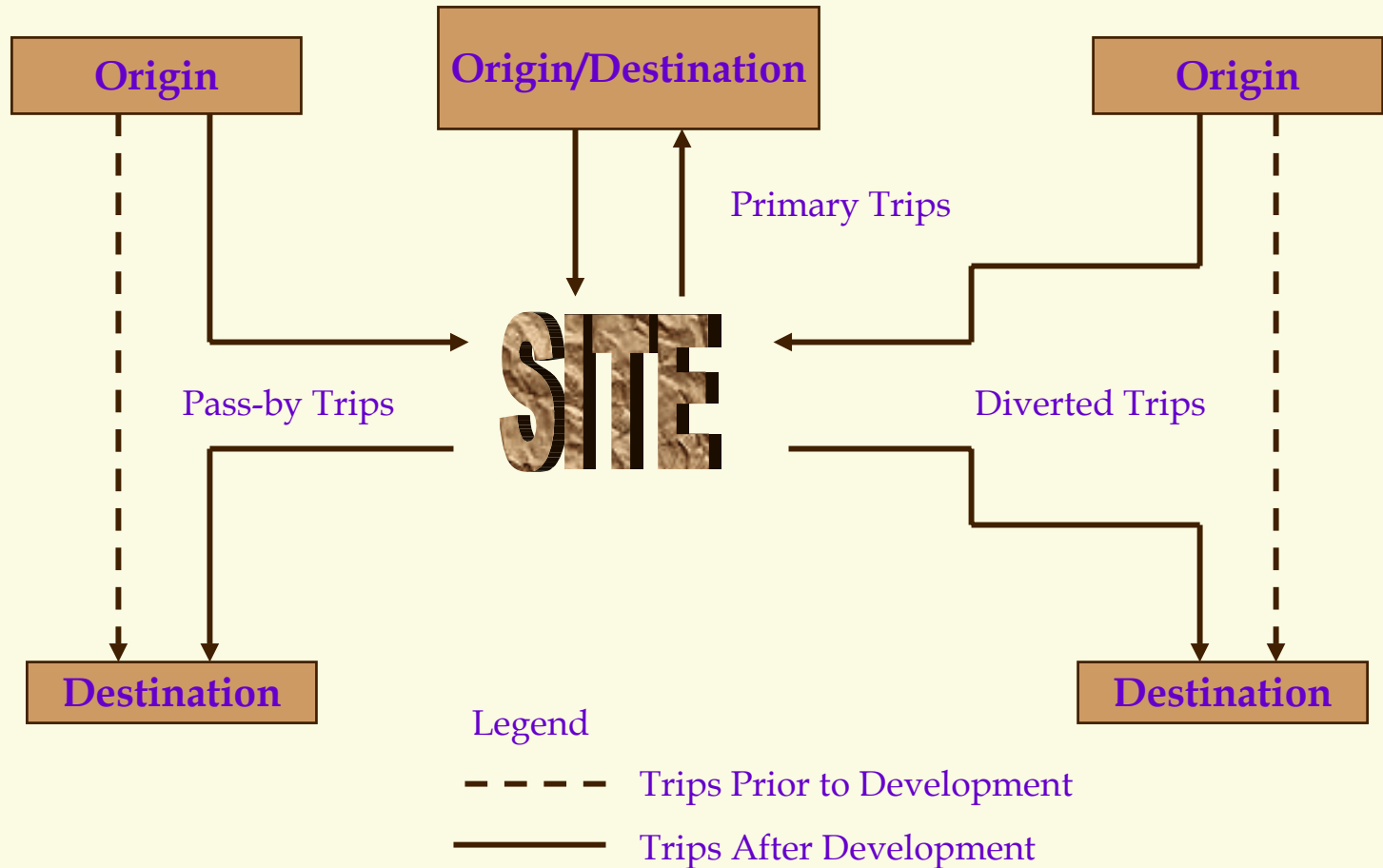Fitted Curve Equation: $Ln(T) = 0.66\, Ln(X) + 3.40$ $R^2 = 0.81$

Methods of Reduction

✔ Used to reduce impact of development.

- – Pass-by trips for retail and service developments.
- – Internal capture trips for mixed-use (multi-use) developments.

Pass-by Trips

✔ Pass-by trip - Intermediate stops made 'on the way' from an origin to a primary destination.

✔ Pass-by trips apply to retail and service land uses only. (LUC 800's and 900's)

✔ Pass-by must be taken from appropriate land use when Trip Generation is calculated.

Types of Trips

Origin

Origin/Destination

Origin

Primary Trips

SITE

Pass-by Trips

Diverted Trips

Destination

Destination

Legend

- - - - - Trips Prior to Development

_____ Trips After Development

Internal Capture

✓ A percentage reduction in trips to account for trips made internal to the site.

✓ Only seen in multi-use developments

✓ Driveway Manual thresholds apply to trip generation calculations prior to reductions for internal capture and pass-by.

New Features for 7th Edition

✓New sub-categories and Land Use Codes

✓Updated descriptions

✓Adjusted statistical data

✓Updated independent variables and time periods

Trip Generation Training

✓ June 21 through July 27, 2004

✓ Training location in each Region

✓ Trained over 120 NCDOT engineers

✓ Focused on overall concepts and hands-on problems

✓ Incorporated local examples

Contacts and Information

✔ Obviously, these examples are very simple. Nearly all developments will be more difficult and complex.

✔ Should you need assistance in the future, please contact myself or Teresa Becher at (919) 250-4151 or by e-mail.

tbecher@dot.state.nc.us

dhspencer@dot.state.nc.us

Thank you!